

Thomas Bury

Curriculum Vitae

Department of Applied Mathematics
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Summary of Qualifications

- Publications in high-impact journals (PNAS, PLOS Computational Biology)
- Engaging speaker at TEDx and several other large conferences
- Research broadcasted by national and international media outlets
- Course instructor for a large undergraduate class which received excellent student reviews

Education

- 2015-current **PhD, Applied Mathematics, The University of Waterloo.**
Thesis: Early warning signals for bifurcations in population ecology.
GPA: 96.4%
Advisors: Prof. Chris Bauch, Prof. Madhur Anand
- 2011–2015 **BA, MMATH, Mathematics, Queens' College, The University of Cambridge.**
First class honours. Courses included theoretical and biological physics.
Director of studies: Prof. Julia Gog

Research Experience

- 2015-current **Doctoral Researcher, Dept. of Applied Mathematics, The University of Waterloo.**
- Developed theory and software to provide early warning signals of bifurcations in time series data.
 - Analysed empirical data from laboratory population experiments, verifying advantages of this software over traditional methods.
 - Constructed and analysed a novel model for climate change coupled to social processes, resulting in international media attention.
- 2014 Jun-Aug **Undergraduate Researcher, DAMTP, The University of Cambridge.**
- Curated and analysed disease incidence data from hospitals across East England, capturing dynamics of the 2009 Influenza pandemic.
 - Presented data visualisations to public health professionals at Addenbrooke's Hospital, Cambridge.

Professional Service

- 2017-2018 **Senate Graduate and Research Council, The University of Waterloo.**
Math grad student representative for matters of academic quality and research activity within the university.

Conferences

Invited talks

- August 2018 ESA Annual Meeting 2018, 'Early warning indicators of ecological tipping points: do they predict critical transitions in multi-stable systems, or something else?'.

Contributed talks

- June 2019 CAIMS Annual meeting, Whistler, 'Detecting and distinguishing tipping points using spectral early warning signals'.
- Jan 2018 Centre for Teaching Excellence, University of Waterloo, 'Breaking the Norm: Cooperative Learning in the Undergraduate Math Classroom'.
- Jan 2018 Dynamics Days U.S., 'Characterising impending transitions in complex systems'.
- Sept 2017 TEDx, University of Toronto, 'Tipping Points and the Role of Mathematics'.
- Aug 2017 AMMCS International Conference, 'Anticipating critical transitions in socio-ecological systems'.
- Jul 2017 Mathematical Models in Ecology and Evolution Conference, City University of London, 'Regime shifts in socio-ecological systems : silent early warning signals in the natural subsystem'.
- May 2017 WICI, Resilience in Complex Natural and Human Systems, University of Waterloo, 'Early warning signals in socio-ecological systems'.

Workshops organised

- May 2018 WICI, Leveraging systems approaches to improve human & planetary health, 'Workshop: A Hands-On Introduction to Mathematical Modelling'.

Publications

Journal articles

- P1 T. M. Bury, C. T. Bauch, and M. Anand. Charting pathways to climate change mitigation in a coupled socio-climate model. *PLoS computational biology*, 15(6):e1007000, 2019.
- P2 T. M. Bury, C. T. Bauch, and M. Anand. Detecting and distinguishing tipping points using spectral early warning signals. *Nature communications (in submission)*, 2019.
- P3 A. D. Pananos, T. M. Bury, C. Wang, J. Schonfeld, S. P. Mohanty, B. Nyhan, M. Salathé, and C. T. Bauch. Critical dynamics in population vaccinating behavior. *Proceedings of the National Academy of Sciences*, 114(52):13762–13767, 2017.

In progress

T. M. Bury, J. Burant, C. T. Bauch, M. Anand, and R. Norris. Early warning signals of extinction for populations in seasonal environments..

Selected Media Coverage

My lead-author publications have featured in national and international news outlets, including

- o [CityNews](#) (Toronto)
- o [The Globe and Mail](#) (Canada)
- o [The National Post](#) (Canada)
- o [The Business Standard](#) (India)
- o [Greenreport](#) (Italy)

Software

- S1 T. M. Bury, ewstools, <https://github.com/ThomasMBury/ewstools>.
A Python package for computing, analysing and visualising early warning signals in time-series data. Includes spectral early warning signals, a novel approach to distinguishing, as well as detecting bifurcations.

Awards and Grants

- May 2019 Travel grant for CAIMS annual meeting. (\$500) *WICI*
- Jan 2018 Travel grant for ESA annual meeting. (\$1000) *WICI*
- Jan 2018 Travel grant for conference 'Dynamics Days U.S.' (\$1000) *WICI*
- Nov 2017 GradTalks research dissemination award (\$500). *University of Waterloo*
- Apr 2017 Public speaking award (\$300). *Fields Thesis Competition*
- Feb 2017 Faculty level winner. *Three-Minute-Thesis competition*
- Jul 2016 Foundation Scholarship. *Queens' College, University of Cambridge*

Teaching

Positions held

- Fall 2018 **Course Instructor**, *University of Waterloo*.
- Course : Calculus I for the Sciences, 115 students, 1 teaching assistant
 - Contribution: Designed and implemented lectures three times a week, contributed to exam and project development, manager of teaching assistant and tutorial sessions.
 - Student evaluations: Very strong (>4.5/5 average for each teaching aspect)
- Fall 2016 **Lead Teaching Assistant**, *University of Waterloo*.
- Course : Calculus I for Engineers, 667 students, 11 teaching assistants
 - Contribution: designed weekly problem sheets with solutions for the course, ran interactive tutorial sessions, held office hours, marked and proctored exams
- Winter 2018 **Teaching Assistant**, *University of Waterloo*.
- Course : Stochastic processes in the physical sciences, 15-20 graduate students, 1 teaching assistant
 - Contribution: gave guest lectures on specialist topics, provided sample code with live demonstrations, extended course notes, marked assignments

Certifications

- 2017-2019 **Certificate of University Teaching**, *University of Waterloo*.
A two year teaching course for PhD students. Includes multiple teaching observations, guided self-reflection and improvement, workshops and a pedagogical research project. Teaching dossier available on request.
- 2016-2017 **Fundamentals of University Teaching**, *University of Waterloo*.
Pre-requisite to the former. Involves weekly workshops and 'microteaching' assessments.

Volunteering

- 2016-current Let's Talk Science: A national, charitable organisation focused on outreach of STEM subjects to schools across Canada. Active volunteer.
- Mar 2017 Centennial Public School, Waterloo: Science fair judge
- Dec 2016 STC Physics Lab Day, University of Waterloo: Facilitator
- Jul 2014 Millennium Mathematics Project, University of Cambridge: Volunteer at mathematical epidemiology workshop for schools.

Memberships

Deep learning in the Information Lab - University of Waterloo
Society for Industrial and Applied Mathematics
Waterloo Institute for Complexity and Innovation
Institute of Mathematics and its Applications

Programming skills

Python, Mathematica, Matlab
C, R

*strong
competent*

Languages

English
French

*native
conversational / B2*

References

Prof. Chris Bauch (PhD co-advisor)

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Prof. Madhur Anand (PhD co-advisor)

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Prof. Julia Gog (Director of studies for Mathematical Tripos)

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Prof. Zoran Miskovic (PhD committee member)

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